

CLAIMS

The invention claimed is:

1. A method of cleaning a processing chamber, comprising:
 - providing a processing chamber having a residue material over at least one internal chamber surface;
 - providing a supercritical fluid in the processing chamber; and
 - contacting the residue material with the supercritical fluid, the contacting removing at least some of the residue material from over the at least one internal surface.
2. The method of claim 1 wherein the residue material comprises at least one member of the group consisting of, a hydrocarbon, aluminum oxide, copper, a copper-comprising material, TiN, Ta₂O₅, barium strontium titanate (BST), lead zirconate titanate (PZT), strontium bismuth titanate (SBT), NH₄Cl, TiCl₄, hafnium oxide, zirconium oxide, a platinum/rhodium alloy, ruthenium, ruthenium oxide, WN_x, W, Pt, iridium, iridium oxide, HfN, Ta, TaN, aluminum nitride and Si_xN_y.
3. The method of claim 1 wherein the residue material comprises an organic material.
4. The method of claim 1 wherein the residue material comprises an inorganic material.

5. The method of claim 1 wherein the processing chamber is selected from the group consisting of a PVD chamber, a CVD chamber, an ALD chamber, a PECVD chamber, a pulsed-CVD chamber and a high density plasma chamber.
6. The method of claim 1 wherein the at least one surface includes a surface comprised by a disperser, a chamber wall or a substrate holder.
7. The method of claim 1 wherein the providing the supercritical fluid comprises flowing a liquid into the processing chamber and generating the supercritical phase from the liquid within the processing chamber.
8. The method of claim 1 wherein the providing the supercritical fluid comprises flowing a gas into the chamber and generating the supercritical fluid from the gas within the processing chamber.
9. The method of claim 1 wherein the providing the supercritical fluid comprises introducing the supercritical fluid into the deposition chamber in supercritical phase.
10. The method of claim 1 wherein the supercritical fluid comprises at least one of CO₂, C₃H₈, N₂O, C₂H₆, CH₄, H₂O, Ar and NH₃.

11. The method of claim 1 wherein the supercritical fluid contains at least one of a co-solvent and a surfactant dispersed therein.
12. The method of claim 11 wherein the super critical fluid has a polar co-solvent dispersed therein.
13. The method of claim 1 wherein the chamber is maintained at a pressure greater than or equal to the critical pressure of the supercritical fluid throughout the cleaning.
14. The method of claim 1 wherein the chamber is maintained at a temperature greater than or equal to the critical temperature of the supercritical fluid throughout the cleaning.
15. The method of claim 1 wherein the chamber is maintained at a temperature of at least about 31°C and a pressure of at least about 72.8 atm throughout the cleaning.

16. A method of removing deposited material from internal surfaces of a processing system, comprising:

providing a cleaning agent comprising carbon dioxide into at least a portion of a processing system, the carbon dioxide comprising a phase selected from the group consisting of liquid phase and a supercritical phase;

contacting the deposited material on an internal surface of the at least a portion of the processing system with the cleaning agent, the contacting solubilizing at least a portion of the deposited material to form a solubilized fraction; and

removing the solubilized fraction from the at least a portion of the system.

17. The method of claim 16 further comprising exposing the deposited material to a pre-treatment substance prior to the contacting, the pre-treatment substance comprising at least one of a solvent and a surfactant.

18. The method of claim 16 wherein the system comprises a trap and wherein the internal surface of the at least a portion of the processing system contacted comprises an internal surface of the trap.

19. The method of claim 16 wherein the system comprises at least one line and wherein the internal surface comprises an internal surface of the at least one line.

20. The method of claim 16 wherein the system comprises a substrate holder, the method further comprising contacting deposited material on a surface of the holder with the cleaning agent.

21. The method of claim 16 wherein the system comprises a disperser and wherein the internal surface comprises a surface of the disperser.

22. The method of claim 16 wherein the carbon dioxide is liquid phase carbon dioxide.

23. The method of claim 16 wherein the carbon dioxide is supercritical phase carbon dioxide.

24. A processing system comprising:
a reactor having a processing chamber;
a supercritical fluid source in selective fluid communication with the processing chamber and configured for selectively flowing supercritical fluid during a chamber-cleaning process; and
a recovery vessel in fluid communication with the processing chamber.

25. The processing system of claim 24 further comprising a cold-trap, wherein the system is configured to selectively flow supercritical fluid into the cold trap.

26. The system of claim 25 wherein the cold trap is disposed in fluid receiving relation relative to the processing chamber and in fluid providing relation relative to the recovery vessel.

27. The system of claim 24 wherein the recovery vessel is in fluid communication with the supercritical fluid source for recycling of the supercritical fluid.

28. The system of claim 24 wherein at least some of any solutes present in the supercritical fluid are removed in the recovery vessel.

29. The system of claim 24 wherein the processing chamber is a deposition chamber.

30. The system of claim 29 further comprising at least one line in fluid communication with the deposition chamber, the at least one line being utilized during deposition processes and being selected from a feed line and an exhaust line, wherein the supercritical fluid passes through at least a portion of the at least one line during the chamber-cleaning process.

31. The system of claim 24 further comprising a co-solvent source.

32. The system of claim 31 wherein a co-solvent is introduced into the deposition chamber from the co-solvent source subsequent to initiating flow of supercritical fluid into the processing chamber.

33. The system of claim 31 wherein a co-solvent is dispersed within the supercritical fluid prior to initiating flow of the supercritical fluid into the processing chamber.

34. The system of claim 31 wherein a co-solvent is introduced into the processing chamber prior to initiating flow of the supercritical fluid into the processing chamber.

35. The system of claim 24 wherein the system is a semiconductor processing system.

36. The system of claim 24 wherein the chamber is selected from a PVD chamber, a CVD chamber, an ALD chamber, a pulsed CVD chamber, a furnace chamber and a PECVD chamber.